PRODUCING PETTY GODS: MARGARET CAVENDISH'S CRITIQUE OF EXPERIMENTAL SCIENCE

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The fathers of early modern science did not wait for their descendants to write their myth of origins: from Bacon's proclamation in 1620 "to commence a total reconstruction of . . . all human knowledge" to Thomas Sprat's boast nearly half a century later that the members of the Royal Society had, for the first time, rendered "the knowledge of nature . . . an Instrument whereby Mankind may obtain a Dominion over Things and not onely over one anothers Judgements," the men involved in advertising the mechanical philosophy and the new mode of experiment advertised as well the revolutionary promise of their endeavors.[1] They were the prophets of a new age, and the golden world they were striving to build would be dedicated, as Bacon said, to "the glory of the Creator and the relief of man's estate."[2]

During the past thirty years, this story has been subject to critical revaluation: revisionist histories from sociological and feminist perspectives tell other stories, stories that focus on social and political relationships and on ideological desires more than on the progress of reason and the discovery of truth. Assessing the now familiar metaphors of violence against women employed routinely during the seventeenth century to describe the relationship between the powerful force of the male scientist's mind and the resistent but ultimately submissive body of female nature, Sandra Harding suggests only half-jokingly the substitution of the phrase "Newton's Rape Manual" for the more common, but equally metaphoric tag, "Newton's mechanics."[3]

Such critical substitutions are slowly becoming commonplace, as feminist historians and literary scholars turn their attention to the foundational texts of early modern science. But it is perhaps less widely recognized that critical valuation of the stories the "fathers" wanted to tell about themselves—valuation, that is, of the stories *as* stories—was available even as they were being told. One such voice of opposition belonged to Margaret Cavendish, Duchess of Newcastle,

who set out, with no formal credentials other than her impressive social title, to critique the newly chartered institution of mechanist and experimental science, the Royal Society. In two intriguingly joined texts, *Observations on Experimental Philosophy* (1666), a response to Robert Hooke's *Micrographia* published the previous year, and *The Description of a New Blazing World*, a utopian science fiction fantasy, Cavendish boldly interrogates the epistemological assumptions and the social agenda that underlie the mechanical philosophy and the experimental method, and, in the process, offers a critique of the new science that is remarkably sensitive to its social and gendered construction.

Although she carried on a correspondence with both Joseph Glanvill and Constantin Huygens, Cavendish's efforts in natural philosophy were by and large either ignored or derided in her own day. While in exile from the Commonwealth government in the 1640s, she had the opportunity to meet Gassendi, Mersenne and Hobbes, along with some of the other important proponents of the newly emerging mechanical philosophy, and, after her return to England at the Restoration, she was granted admission for one day to the Royal Society to watch selected experiments performed for her amusement and, presumably, her admiration.[4] But these opportunities were made available to her only because of her social status: connected with the royal court and married to William Cavendish, one of King Charles's leading military commanders, Margaret had aristocratic standing long before she became a duchess. Knowing that her sex alone disqualified her from any serious consideration among her contemporaries as a natural philosopher, Cavendish sent copies of her philosophical works to both Oxford and Cambridge, hoping that, although ignored in her own lifetime, her work would be kept and discovered in aftertimes, among a more congenial audience.[5] The universities magnanimously complied, though again probably because, given her social status, it would have been an outrageous insult not to have done so.[6] But others were not so silent: Dorothy Osborne, reflecting on Cavendish's ostentatious publication of her writings, considered that "there are many soberer people in Bedlam"; Pepys reported in his diary on the Duchess's visit to the Royal Society that he did "not like her at all, nor did [he] hear her say anything that was worth hearing"; and Walter Charleton claimed in an obsequious letter to Cavendish that he was unable "to discover much" in her natural philosophy wherein he thought himself "much

obliged to acquiese" (and then he sought to calm her distress that her philosophy had not "the fate to be publickly read in all the Universities" with the soothing reminder that "while Men are Men, there will be different Interests").[7]

As much as many nowadays want to resurrect Cavendish and her literary reputation along with her, the arguments about her science are not that different from those that prevailed three hundred years ago. At best, her scientific thought is deemed "an interesting if unimportant by-product of the Scientific Revolution."[8] Even Carolyn Merchant, whose eco-feminist critique of early-modern science affiliates the emergence of the mechanical philosophy with the forcible domination of women, laborers, and the environment, devotes only two and a half pages to Cavendish and entirely ignores her *Observations*.[9] And Londa Schiebinger's comprehensive study of women in early-modern science briefly surveys Cavendish's philosophical works without really assessing their worth.[10]

In general, Cavendish's modern readers have tended to explain her rejection of experimental and mechanical philosophy on biographical grounds. Although born and married into monied families, Cavendish lacked a formal education, and even though she knew some of the most influential scientific thinkers of her time, she was denied access because of her sex to the correspondence networks and the increasingly formal institutions that constituted the forums for contemporary scientific practice. The argument runs, then, that Cavendish elected to follow in her natural philosophy the simple guides of sense and reason because those were the only avenues open to her. Without the opportunity to participate in the Royal Society's ventures, without the chance to consider the new technologies and instruments with other people who were experimenting with them, Cavendish had no alternative but to fall back on the only "methods" that were available to her: what her unaided senses perceived and what she could "reason out" for herself, without any training in logic or mathematics.[11]

If Cavendish failed to recognize the supposedly superior truth-value of mechanical philosophy and the experimental method; if she promoted without experimental evidence an idiosyncratic philosophy of organic materialism; if she wrote at length uneven and frequently contradictory prose, her modern apologists want to forgive her perceived trespasses because they want to rescue her as an important female writer of the seventeenth century: she was certainly the most prolific, publishing fifteen original works of poetry

and prose over twenty years, and was occasionally even a mouthpiece for what are deemed to be feminist complaints about the lack of education offered to gentlewomen and their compulsory life of unproductive leisure.

But these approaches to Cavendish and her writings ultimately limit our understanding of the value of her work in natural philosophy, for two reasons. First of all, to try to excuse Cavendish's rejection of the mechanist model of nature ignores both the then-unproven status of mechanism and the contemporary viability of her own attempts at natural philosophy. Cavendish wrote her critique of experimental philosophy in the earliest years of the Royal Society's functioning, years during which the members were routinely under attack for not producing incontestible results: there was in the 1660s no definitive sense that mechanism was the most profitable or effective metaphor for conceiving of nature's ways.[12] Second of all, most scholars have ignored the positive value of the critique she offers, one that evokes modern revaluations of the rational bases of the natural sciences. Cavendish's commitment to organic materialism gave her the ability to offer a "stranger's account" of the new science and thereby to display epistemological problems and social pretensions in the claims of the experimentalists. Thus, although the gender-based intellectual and institutional constraints she lived under denied her the ability to explore the uses of experiment, those very constraints gave her the opportunity to consider the practice and the epistemological claims of experimental science from the intellectual margins. Unlike experimentalists such as Hooke and Boyle, and unlike apologists such as Sprat and Glanvill, Cavendish had nothing at stake in promoting the methodologies of the new science: she was not seeking funding for a fledgling institution, nor was she seeking to assure the continued support of the crown. Ideally, Cavendish wanted her ideas to be included in the process of debate; denied that, she offered an analysis that is insightful precisely because it is spoken from outside the discursive and institutional forums it explores.[13]

In claiming the availability and value of such a perspective, my argument suggests the paradoxically privileged position of the margins. But Cavendish's own position did not call for a return from the margins: she did not (as some feminists do today) urge the entrance of more women or women's issues into the existent structures of scientific research, and she did not believe that *as a woman* she had access to any privileged epistemological standpoint; in fact, she

doubted the very possibility of claiming any such privileged knowledge positions existed. Cavendish's critique of experimental science and the value of her adopted alternative to mechanism more closely approximate current critiques of science that question the very grounds on which early modern science was built: that is, its assumptions about context-free knowledge, reduction to method, and the eventual comprehensiveness of theory. In this sense, I shall argue, Cavendish's position is most insightful because it sees claims of methodological rigor, value-neutrality, and objectivity, not as monolithic conduits for achieving certainty, but as social constructions that are endorsed as much because they advance the needs of their adherents as because they are deemed to be scientifically effective or true.

Cavendish, of course, was not alone in her opposition to mechanism and the experimental method. In the early 1660s, for example, Thomas Hobbes and the Cambridge Platonist Henry More each published critiques of mechanist experimentalism, especially as it was represented in Boyle's *New Experiments Physico-Mechanical*.[14] To be sure, Cavendish's philosophical viewpoint and objections to mechanist experimentalism overlapped to some extent with each of theirs: with Hobbes, Cavendish shared an insistence on material monism and a belief that only a rational inquiry into the causes of phenomena could constitute true philosophy; with More, Cavendish shared a belief in the insufficiency of mechanism as an explanatory model for natural phenomena. But Cavendish's position differed from theirs far more than it cohered with them; she even published an attack on each of them in her *Philosophical Letters* of 1664.[15] Cavendish's critique of the new science was unique on at least two grounds: first, in that it charged that the mechanist model and the experimental method were more potent as social than as epistemological constructions; and second, in that it recognized the functioning of gender in that construction.

I propose, then, to analyze afresh the critique of experimental science offered in both the *Observations* and its companion piece, *The Blazing World*. In tandem with this, I shall explore Cavendish's alternative to what she called "the mode philosophy"—her own philosophy of "organic materialism," which held that "Nature is a self-moving, and consequently a self-living and self-knowing infinite body."[16] What will emerge is a rather startling similarity between Cavendish's position and a post-Kuhnian and even a proto-feminist critique of the rational bases of mechanical science.

An analysis of Cavendish's science therefore works on two fronts.

First, it enables a more effective entrance into the vexed issue of Cavendish's feminism: as a committed Tory and member of the Church of England, Cavendish was an ardent proponent of social hierarchy who routinely affiliated by class rather than by gender and who happily vacillated both between and within works on the innate capability or weakness of women. Understandably, this has produced some difficulty for her modern readers, who might wish a more consistent advocacy for women's rights. But an assessment of Cavendish's science, precisely because it stresses her epistemology and modes of analysis over her advocacy of (or her indifference to) special interests, allows us to recognize in her works an unusual awareness of the constitutive role of gender relations in science. This awareness may not suffice to deem her a feminist, but it does forcefully anticipate what has become a defining feature of feminist analysis. Second, beyond its significance to an understanding of Cavendish herself, an examination of her mature scientific texts also contributes to the now-ongoing revision of the history of early-modern science, specifically because it relocates gender-inflected analysis back into the seventeenth century and thereby demonstrates the availability of *contemporary* critiques of science as a rational inquiry into value- and gender-neutral truth.

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The book Cavendish chose to attack—Robert Hooke's *Micrographia*—was a model of all the Royal Society promoted: lavishly printed with large, detailed engravings, the text recorded Hooke's extensive experiments with the microscope, which he had newly improved to better illuminate his subjects. The book was the first to publicize the revelatory powers of the microscope, and, because it bore the imprimatur of the Royal Society, its methods, illustrations and results carried the endorsement of the new institution of mechanistic science. In choosing the *Micrographia* for critique, Cavendish focused on a specific text, but through it she voiced her opposition to the Baconian enterprise as a whole, from its claims of procedural objectivity and the value-neutrality of its findings to its promises of social renewal and intellectual progress.

One of the most trumpeted claims of the new science was its procedural emphasis on objective observation and neutral experiment: Bacon believed that his "New Organon" would allow the eventual erection of a comprehensive philosophy of nature because it would be based on matters of fact revealed through experiment

and direct observation; it would thus be distinguished from Aristotle's "old" organon because the accuracy of observation, made possible by the neutrality of experiment, allowed a precise division between certainty and probability, fact and fiction. In his *Great Instauration*, Bacon had guaranteed the reliability of experiment by restricting the experimenter's reliance on the senses and expanding commensurately the role of the experimental instrument:

> The office of the sense shall be only to judge of the experiment, and the experiment itself shall judge of the things.[17]

Bacon's awareness of the potential for deception in all human understanding (his "doctrine of Idols") only made more compelling his claim that these distortions could be balanced by the unquestioned neutrality of the instrument. Though observers were to remain dutifully skeptical about causes, controlled and collective observation by trustworthy witnesses was to yield matters of fact about which one could be "morally certain."[18] The objectivity of science was assured because "the whole business will be done as if by machinery": science would proceed by a strict, mechanical application of experimental method to neutral cases.[19]

In his *Micrographia*, Hooke showed himself to be aware of both the need for and the problems of such claims. Echoing Bacon, Hooke urged "the plainness . . . of Observations on material and obvious things" rather than the work of "the brain and the fancy," which had a dangerous tendency to create and fabricate rather than merely to discover and reveal.[20] Carefully used, Hooke maintained, instruments of observation like the microscope could provide access to that solid world of material truth. But in his preface, Hooke admitted that objects he viewed under the microscope looked different when positioned at different angles and under different lights. He therefore assured his readers that he

> never began to make any draught before, by many examinations in several lights, and in several positions to those lights, [he] had discovered the true form [of the object].[21]

Aware that microscopes had the ability to distort as well as to reveal—aware, that is, that his instrument did not so neatly reveal simple matters of fact—Hooke nonetheless argued that what he called the "true form," or the "true appearance" of the object he viewed was available to him by simple manipulation of his instrument. Readers could therefore be comforted that the illustrations

they saw in the elaborately produced volume were nonetheless "true and plain representations" of the objects he had observed.

In trying to guarantee the facticity of the engravings, however, Hooke had in fact revealed the participation of his fancy. The engravings, as he admitted, were actually *composite* renditions of objects seen under different lights and at different angles; they were representations, in other words, not of a monolithic object easily revealed under the scrutiny of an instrument, but of some combination of images formed in the viewer's mind. Thus the microscope, which yielded different images in different settings, and the observer, who was responsible for reconciling those images, each actively participated in the presentation of what was supposed to be a univalent matter of fact.

In her response to Hooke, Cavendish seems to have recognized the importance of this active participation. For one thing, it meant that the much-touted instruments simply did not perform as advertised: rather than correct the distortions of the senses, the optical glasses of the "mode philosophy" exacerbated them. Surely, for example, it was "a deceit of the optick instrument" that led Hooke to claim that the drone-fly he observed under the microscope had 14,000 eyes; nature simply would not make such "vain and useless things" (*O*, 1.23). Such distortion occurred according to Cavendish because the microscope was an instrument not of revelation, but of creation:

> It is not the real body of the object which the Glass presents, but the Glass onely figures or patterns out the picture presented in and by the Glass, and there may easily mistakes be committed in taking copies from copies. (*O*, 1.9)

Rather than being an instrument of discovery, one that without intrusion of its own materiality transparently reveals a previously unseen world, the microscope "figures or patterns" materials and light, somewhat as a kaleidoscope does. Under Cavendish's gaze, then, the engravings offered by Hooke lose their claim on univocal simplicity and become instead more closely aligned with the polyvalence of art. Furthermore, because "there may easily mistakes be committed in taking copies from copies," the observer cannot claim to be neutral, either; his own designs, intentional or not, are engaged in the production of the pictures. The art of microscopy, therefore, yielded what Cavendish called "hermaphroditical" or "mixt figures, as partly Artificial, and partly Natural" (*O*, 1.8). Neither wholly discov-

ered, nor wholly made, the images observed through a microscope's lens comprised a third, liminal entity that mediated between Nature and Art and connected, rather than divided, the senses and the fancy. In challenging the transparency of the instrument and the perceptual passivity of the observer, Cavendish's critique of the microscope blurred the epistemological boundaries claiming to distinguish fact from fiction, discovery from creation, truth from fancy.

To further her attack on its purported objectivity, Cavendish derided the new science's claim that it pursued knowledge with selfless disinterest and even with altruistic intent. Announcements about personal disinterest extended most generally to claims about the broad social program of the new science, which, in Bacon's memorable phrase, promised "the relief of man's estate."[22] In *Micrographia*, Hooke perpetuated such claims, though on the most general level of endorsing the experimental method rather than the powers of the microscope alone. If, Hooke argued, people would only follow the Baconian method (which sought truth foremost above profit), "there is nothing that lyes within the power of human Wit (or which is far more effectual) of human Industry, which we might not compass."[23] Indeed, Hooke argues, "thoroughly prosecuting" the Baconian method holds the unique promise of Paradise regained:

> As at first mankind fell by tasting of the forbidden Tree of Knowledge, so we, their Posterity, may be in part restor'd by the same way, not only by beholding and contemplating but by tasting those fruits of Natural knowledge that were never yet forbidden.[24]

Following Bacon and others, Hooke was announcing the *redemptive* powers of the new science, powers supposedly beneficial for all, because its possessors worked for the good of all.

Cavendish thoroughly rejected such rhetoric. She charged that mechanical philosophy and the experimental method were advanced precisely out of self-interest, and, even more, that her own, equally-credible philosophy of organic materialism was opposed not because of any inherent falsity, but because it could not accommodate the self-aggrandizing purposes of mechanism. Modern writers of natural philosophy, she claims, seek nothing more than fame: they attack the ancient authors because,

> like those unconscionable men in Civil Wars, [they] endeavour to pull down the hereditary Mansions of Noble-men and Gentlemen, to build a Cottage of their own . . . to render themselves famous. (*O*, c2^{r})

Cavendish's comparison of the new scientists to the revolutionaries in the recent civil wars is particularly instructive here, both because it reveals the social conservatism embedded in her intellectual critique, and because it so neatly indicates her sense of natural philosophy as a discipline of self-interested, and even egoistic, construction, rather than one of rational discovery or passive revelation, as the new scientists had claimed. She therefore contends that the experimental and mechanical philosophy is urged solely to set man "a degree above nature," and that men fear and deride an animate nature—the cornerstone of her own philosophy of organic materialism—because "they would fain be above Nature, and petty Gods." "I perceive," she says, that

> Man has a great spleen against self-moving corporeal Nature, although himself is part of her, and the reason is his Ambition; for he would fain be supreme and above all other Creatures, as more towards a divine Nature: he would be a God, if arguments could make him such, at least God-like, as is evident by his fall, which came meerly from an ambitious mind of being like God. (*O*, 2.24)

Cavendish contends that though man is "part of" and therefore properly to be associated with a female nature, his ambition drives him to deny both her and her ascendancy and instead to align himself, falsely, with God. For Cavendish, men pronounce upon a dead, mechanical nature because man is thereby made easy master. Natural philosophy becomes less a means of truth-finding than of masculine self-promotion.[25]

Cavendish's critique thus undermines the Baconian distinction between "proud" and "pure" knowledge: in his desire both to sanction natural philosophy on religious grounds and to enforce the claim that it was free from self-interest, Bacon had argued that the Fall from paradise resulted specifically from a desire for the *moral*, or "proud," knowledge that intended to set man equal to God; by contrast, knowledge about the natural world was "pure," and its acquisition was mandated by God.[26] But Cavendish charges that such a distinction is impossible in the case of the "mode philosophers": for them, so-called pure knowledge *is* proud knowledge, because their ideas about nature result from their "ambition" to be "supreme and above all other Creatures." Cavendish thus suggests that natural philosophy cannot rightly be set aside from other forms of knowledge: despite any claims to the contrary, statements that masquerade as "purely" about "nature" are nonetheless socially-motivated and are useful collectively be-

cause they allow men to think themselves "petty gods" capable of controlling that "wise and provident Lady," nature. (*O*, 1.101)

Cavendish's critique of mechanical philosophy, however, does more than simply reject its implicit agenda of masculine self-aggrandizement: it actually explodes its very notion of the self and its subjectivity. Viewing nature as a discretely ordered and predictable machine permits a commensurate view of the self as an autonomous knower whose subjectivity need not enter into the evaluation of knowledge production—a self we now loosely call "the humanist individual." Bacon's assurances about the neutrality of the instruments used in experiment were supposed to guarantee just such epistemological autonomy: by using instruments and experiments to remove the observer from the world observed, human agency would not have to be accounted for in the discovery of knowledge about nature. Because mechanists could assert the inviolable boundary between subject and object, they could reasonably guarantee the accuracy of their results.

By rejecting mechanical philosophy, Cavendish rejected the validity of the subject-object boundary and the self-construction it implies. The alternate vision of nature that she develops in her *Observations*—organic materialism—is significantly less conducive to the idea of an autonomous individual. After rejecting atomism in the 1650s, Cavendish turned to a radical materialism, which held, like Hobbes, that nature consists of matter in motion, but, unlike Hobbes, argued that matter, although hierarchically organized as rational, sensible, and inanimate, is self-moving, self-knowing and alive. The whole of nature is then an organism, and therefore allows no workable, consistent distinction between rational subject and disparate object. The result is a thorough skepticism about attaining certainty, even about "matters of fact":

> Although each particular creature or part of Nature may have some conceptions of the Infinite parts of Nature, yet it can not know the truth of those Infinite parts, *being but a finite part it self* . . . [Because] Man is but a small part, and his powers are but particular actions of Nature, . . . he cannot have a supreme and absolute power. (*O*, 1.5; emphasis added)

Cavendish's assertion that nature cannot be wholly known arises not merely out of a confrontation with the enormity of nature's infinite, but also out of a belief that man is inextricably *a part* of the nature he seeks to know: there simply exists no outside vantage point from which to view and thereby to control some object called nature.[27]

Cavendish's acceptance of organic materialism therefore holds implications for her vision of the self: like the object of its study, the self for Cavendish is irregular, prone to contradiction, and non-discrete.[28] As an *oeuvre*, her writings support this view: often criticized for her lack of coherence, Cavendish frequently contradicts herself not only between works, but often within the same text. But the notion of coherence itself, the idea of consistency and regularity, seems for Cavendish to be a construct (her word would be "artifice"); she seems to sense that the desire to reduce to simplicity, to mathematical neatness, has more to do with the desire to promote a certain image than it has do to with being accurate to some empirical truth. Her notorious penchant for dressing in male attire and the frequency of cross-dressed characters appearing in her numerous closet dramas both suggest that for Cavendish identity and gender are flexible hybrids, and that autonomy and self-consistency are electively assumed or performed rather than essentially given.

This resistance to self-consistency is evident in Cavendish's writing as early as her autobiography (1656), where, as Sidonie Smith has shown, Cavendish offers a brief history of what appear to be two discontiguous and contradictory selves—the shy, sexless and nearly voiceless young woman and the outspoken, literate female who desires the public recognition she claims to deserve.[29] Cavendish makes no attempt to reconcile these two images of self; for Smith, who assumes the existence of a real self whose story is being told, one version is taken to be true (the outspoken), the other the necessary mask worn to appease patriarchal expectations for virtuous female behavior. But Cavendish herself gives no indication of preferring one version to the other, and, as Smith herself notes, each version adheres closely to the conventions not of lived lives but of pre-existent literary genres, the saint's life and the *res gestae*, the biographical forms open to women and men respectively. If we refuse then to privilege one story over the other, the result is an autobiography that itself refuses to offer a consistent image of the self. Cavendish sets out to write a history of her brief life, to offer to posterity a record of herself, but demonstrates, perhaps unwittingly, that there exists for her no unitary self whose history can be told.

It seems to me that a similar resistance to boundary divisions—to those constituting identity as well as epistemological categories—is functioning a decade later in Cavendish's science fiction narrative, *The Description of a New Blazing World*. The work is now receiving a good bit of attention, though generally in ways that ignore its

relation to its companion piece, the *Observations*, with which Cavendish published it both in 1666 and in 1668. On the whole, readers have seen *The Blazing World* as a form of wish-fulfillment: Cavendish states in her Preface to the Reader that since she cannot be a real ruler like Henry the Fifth or Charles the Second, she will endeavor to be "Margaret the First" in fiction; her utopian narrative then becomes a simple fantasy of female domination.[30] When it is considered in light of her *Observations*, the *Blazing World* is routinely treated as Cavendish's apologetic retreat: unable to make a believable mark in the "real" and difficult world of fact, the argument goes, Cavendish escaped into the easy world of fiction.[31] But to my mind, the *Blazing World* actually continues the critique of experimental science begun in the *Observations*, though with some important differences: like the philosophical text, Cavendish's vision of Paradise, the capital of her utopian society, deconstructs the assumptions and claims about nature, knowledge and the self that implicitly or explicitly pervade the new science project; but the *Blazing World* also demonstrates—as the *Observations* does not—Cavendish's asymmetrical deployment of class and gender as categories of critique.

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The Blazing World is a disjointed story of a lady, who, through a briefly told series of events, is stolen away against her will and winds up Empress of a hitherto unknown world attached to hers at its north pole. In its first part the narrative concerns the intellectual investigations of the Empress, who establishes "scientific societies" and questions their members at length about their working procedures and findings. The second part of the narrative concerns the successful attempt of the Empress and the Duchess of Newcastle (whose disembodied soul the Empress has called into her world) to protect the Empress's native country from foreign aggression and to achieve imperial control of her world.

Cavendish's decision to publish her most considered work of natural philosophy along with a utopian fantasy necessarily raises questions about the relation between the two texts. At first, the relation Cavendish establishes between the *Observations* and *The Blazing World* seems to endorse the very distinctions between fact and fiction, sense and fancy, that she wanted to deny in her critique of experimental philosophy. In her preface to the text, Cavendish suggests that her *Blazing World* bears no epistemological or proce-

dural relation to her more "studious" *Observations*; her purpose is merely to divert her thoughts and to delight her readers. She states:

> Reason searches the depth of Nature, and enquires after the true Causes of Natural Effects; but Fancy creates of its own accord whatsoever it pleases, and delights in its own work. The end of Reason, is Truth; the end of Fancy, is Fiction.[32]

Wholly disparate in method and goal, *The Blazing World* would seem the antithesis of the *Observations*. In making such distinctions, Cavendish apparently encourages her readers to view *The Blazing World* as a retreat from the demands of truth into the pleasures of fiction. At first seeming to endorse these distinctions between the texts' procedures and goals, however, *The Blazing World* slowly but fully confounds them, and, in the process, advances Cavendish's critique of science.

The distinction between truth and fancy, first introduced in the preface, is reiterated in the topography, and the characters of the tale itself. Initially, *The Blazing World* seems to concern only two worlds: the one the Lady comes from and the one to which she travels when her boat is forced by a tempest "into another World."[33] Cavendish suggests that the first is a representation of the "real" world both by referring to it as "our" world (thus the world shared by the narrator and her readers), and by referring to "real" English thinkers and writers who are said to inhabit the Lady's world: John Dee and Ben Jonson, among others (*B*, 1.66–67; 166). If the Lady's world, then, corresponds to "our" real, extra-textual world, the Blazing World she visits exists only within the fanciful world of fiction. Since Cavendish says in her preface that she has joined "this piece of Fancy" and her "philosophical Observations" as "two Worlds at the ends of their Poles," the division between worlds seems to correlate with the division between texts: the "factual" world from which the Lady is taken corresponds to the *Observations*, just as the fictitious world to which she travels corresponds to *The Blazing World* (*B*, b1^{v}; 124). Similarly, the tale supports at first two characters, each seeming to correspond to a distinct category: the first person narrator, who seems synonymous with the "true" voice of Cavendish heard in the preface to the reader, and the Lady, who, both as Empress of a world and as a woman interested in the study of nature, seems a fictitious projection of the author. Both in place and in person, then, the story seems to function according to the neat

division Cavendish wrote of in her preface between what corresponds to the true and what corresponds to the fictive.

But the text seems to establish these binaries only to undermine them. For little more than half-way through the text, we discover that there are not two, but infinite worlds, and that the world the Lady comes from does not correspond at all to what the narrator has routinely been calling "our" world. Moreover, there are not merely two voices of Cavendish peopling the text: eventually, when the Empress calls upon the soul of the Duchess of Newcastle to be her scribe and advisor, Cavendish introduces into her text *another* surrogate or projected version of herself that makes impossible an easy and monolithic correlation between character and creator. Now Cavendish-the-character's world seems the representative of the "real," and the world where the Empress (previously, The Lady) once lived—which purported to correspond to "ours"—turns out to be a fiction.

If all this seems a bit dizzying, it is perhaps meant to be, for the text dislocates all categorical stability. In fact, Cavendish takes the eradication of oppositional categories to its limit by effacing the very premise on which she had in her preface distinguished *The Blazing World* from the *Observations*. Cavendish had there claimed that *The Blazing World* was a work of fiction, whereas the *Observations* was an enquiry into truth. Yet other than differing by its fictive narrative frame, *The Blazing World*, especially in its first part, shares significant common ground with the *Observations*, treating many of the same issues and offering many of the same arguments: the questionable value of the experimental method, the untrustworthiness of optical instruments, the contentiousness and unproductiveness of scientific societies.

The experimenters, for example, look through their telescopes only to discover that they cannot at all agree on what they have seen. The optical glasses are determined to be "false Informers," because they both delude the senses and are insufficient to settle any matters of fact. When the Empress therefore commands that the experimenters break their glasses, they protest on the grounds that the instruments "give one man the ability to be thought more wise than another": telescopes, in other words, are in *The Blazing World* just what microscopes are argued to be in the *Observations*, namely, instruments more useful for social and intellectual distinction than for scientific discovery (*B*, 1.27–28; 142).

Furthermore, this episode in Cavendish's fiction functions as an epistemological critique of the new science's claim that a boundary could be marked between matters of fact, about which consensus was to be expected and therefore could be deemed certain, and explanatory causes, about which disagreement was permissible and which therefore could achieve only the status of probability.[34] By having the experimenters disagree even on what they physically observe (that is, not only on what might cause the perceived effects), Cavendish challenges the reliability of such a boundary.

Given, then, this commonality of topic between the two texts, one might be hard pressed to establish a fast distinction between the "truth" pursued in the one text and the "fiction" created in the other. Furthermore, when the Empress and the Duchess each determine to create for themselves interior worlds to conquer, the Duchess rejects the world-models offered by Pythagoras, Plato, Epicurus, Aristotle, Descartes and Hobbes, only to decide to "make a world of [her] own invention," which, it turns out, is precisely the organic, self-moving, material world she had described and urged in her *Observations* (*B*, 1.101; 188).

If the story itself only implies the conclusion that natural philosophy, along with *all* conceptual schema about the world, proceed at least as much by creation as by discovery, Cavendish becomes more explicit in her Epilogue to the Reader, which finally obliterates the distinctions established in her preface. "By this poetical Description," she says,

> you may perceive, that my ambition is not onely to be Emperess, but authoress of a whole World; and that the Worlds I have made, both the Blazing and the other Philosophical World . . . are framed and composed [by] . . . my Mind. (*B*, 2.35; 224)[35]

In the end, the two texts have merged in Cavendish's framework: both the rational philosophy of the *Observations* and the "rational" fiction of *The Blazing World*—as, too, the experimental, mechanical philosophy they critique—are all products of the mind.

The Blazing World, then, complicates the dimensions and perception of the real, true, and rational. The text abounds with worlds—both the infinite terrestrial worlds strung together like beads on a string, and the celestial, psychic worlds created by the Duchess and the Empress—as it abounds with selves. Noticing this proliferation of selves and worlds in Cavendish's tale, Catherine Gallagher has argued that Cavendish's purported desire for absolute subjectivity,

for a completely contained microcosm of the self, paradoxically ramifies in *The Blazing World* into a multiplicity of subjectivities—an infinite regress of selves within selves and worlds within worlds.[36] But rather than demonstrating the inviolable absoluteness of a discrete self, the vertiginous process Gallagher describes actually demonstrates in Cavendish's text the unavailability of an originary, foundational self that unilaterally produces the others. For if the forward progression of selves—the narrative Cavendish, the Lady-turned-Empress, and the scribe Cavendish—suggests always another self (since, as Gallagher notes, the world the Duchess creates inside the Blazing World will presumably house a character who wants to create a world, *ad infinitum*), there is no reason to assume that the progression does not go backwards as well—that the self that creates the Blazing World is not itself created by some previous self. The origins and discrete existence of the self thus become elusive: the self is endlessly generated, like the infinite, organic world it occupies.

With such a proliferation of worlds and selves, then, Cavendish clearly uses her utopian tale to continue—rather than to retreat from—her assault on experimental, mechanical science, based as it is in the assumption of a discrete self and a stable object. The fundamental difference between the *Observations* and *The Blazing World* is less one of argument than of readerly experience: where the *Observations* claims the impossibility of an autonomous self, *The Blazing World* manifests it by multiplying the selves who people its multiple worlds; similarly, where the *Observations* claims the impossibility of neutral observation, *The Blazing World* dramatizes it when its experimentalists cannot agree on what matter of fact they have observed.[37] As a whole, *The Blazing World* dramatically plays out the logic of the *Observations*, forcing its readers through its storyline to experience the breakdown of the epistemological boundaries that regulate the new science project.

But if *The Blazing World* endorses the work of the *Observations*, it also extends the critique offered in the philosophical work, because as an envisioned society, the Blazing World can investigate the social ramifications and uses of science and technology, much as Bacon's *New Atlantis* had decades earlier. As a utopian narrative, *The Blazing World* responds to the routine promises of Edenic return made possible by science. But far from endorsing the simple belief in science as a means to paradise, Cavendish exposes the workings of the connection: freely practiced, scientific association in the Blazing

World produces disunion and dangerous descensus more than any useful knowledge; the Duchess therefore advises the Empress to dissolve the societies because "their perpetual disputes and quarrels" threaten to "break out into open Wars, and draw . . . an utter ruine upon [the] State or Government" (*B*, 1.122–23; 201). The utopian unity of the Blazing World arises not out of communal desire, but rather out of the autocratic control of knowledge production.

Although the experimental study of nature cannot produce utopian unity in Cavendish's envisioned world, the autocratic application of the Blazing World's weird technology is nonetheless able to enforce it. Looking, for instance, for a way to keep her people from "desert[ing] the divine Truth" to which she has so recently converted them, the Empress, equipped through mining and aero-technology with the wondrous blazing stones after which her world is named, constructs two chapels that would keep her people in "a constant belief":

> the one she lined throughout with Diamonds, both Roof, Walls and Pillars; but the other she resolved to line with the Star-stone; the Fire-stone she placed upon the the [sic] Diamond-lining, by reason Fire has no power on Diamonds; and when she would have that Chappel where the Fire-stone was, appear all in a flame, she had by the means of Artificial-pipes, water conveighed into it, which by turning the cock, did, as out of a Fountain, spring over all the room, and as long as the fire-stone was wet, the chappel seemed to be all in a flaming fire. (*B*, 1.61–62; 163–64)

Technological prowess here produces unity, but only by inducing fear: religion is maintained through trickery. Artificial contrivances do not so much relieve man's estate, as keep it quiet.

The second part of *The Blazing World* further demonstrates the actual uses of scientific progress in the affairs of state. Far from offering intellectual or material benefit on a democratic scale, knowledge about nature and control of natural resources provide a powerful means of achieving astonishing self-promotion and imperial domination. Using the pyrotechnics provided by her fire-stones, the Empress contrives to appear before her beleaguered countrymen as a veritable god:

> The appointed hour being come, the Emperess appear'd with Garments made of the Star-stone, and was born or supported above the Water, upon the Fish-mens heads and backs, so that she seemed to walk upon the face of the Water. . . . Which sight, when her Country-men perceived . . . all kneeled down before

her, and worshipped her with all submission and reverence. (*B*, 2.12; 210)

Having achieved divine status, the Empress convinces her native government to wage war against its enemies and to use as weapons the precious fire-stones: she uses them to incinerate her enemies' naval fleet, and she subsequently forces "all the rest of that World to submit" by planting the fire-stones underneath and on the rooves of all the houses of those who refuse to pay a trade tariff to her king (*B*, 2.18; 211). By these drastic means, made available to her through mining, air-flight, and the sophisticated structures of her golden submarines, the Empress effectively subjugates her entire world, establishing her native country as "the absolute Monarchy of all that world" and its king as absolute ruler (*B*, 2.20; 212). In her final apotheosis to her native land, the Empress contrives once again "to walk upon the Waters" and appears to her subjects as "an uncreated Goddess" (*B*, 2.21; 215).

Clearly, Cavendish revels in this vicarious self-promotion to national dominion and apparent godliness, and her description of how these joys are achieved—through exploiting the natural resources of the Empress's adopted land, through tricking her subjects and her enemies into thinking her to be something she is not—entails on her part no trace of self-reflective irony. Cavendish's exploration of science's role in utopia, then, involves not a chastisement of the partisan social uses of scientific knowledge, but a forthright demonstration that, contra Bacon, progress does not serve the broadly humanitarian and altruistic goals the new scientists had claimed. The capital city of the Blazing World, called Paradise, is a religious and social utopia (with one ruler, one religion, and one language), but only, it seems, because its rulers are able to use the native technologies and scientific knowledge to control its inhabitants: science, in other words, creates paradise, but not for all.

If the *Observations* had suggested the existence of such self-interest in its critique of mechanism as an epistemology that allows the production of "petty gods," *The Blazing World* again plays upon the arguments of its companion text, now using science to produce an actual "petty god," or, more precisely, an "uncreated goddess" able to exert total control over her environment. It is, of course, ironic that in the first text Cavendish critiques the epistemology that allows the construction of "gods," but in the second endorses the hierarchical social arrangements that allow her surrogate to control

science's selective boons. But the contrast actually pinpoints the character as well as the limits of Cavendish's vision, especially regarding class and gender: Cavendish's work relentlessly deconstructs the supposedly stable epistemological categories that service the masculinist science she derides, but it does not oppose at all the class and gender divisions that regulate the social structures of her society. When forced because of her sex to be an outsider to the strongholds of the scientific community, Cavendish was able to discern, presciently perhaps, the constitutive role of gender in knowledge production. But when she is allowed by her fantasy to be an insider, the gender critique vanishes before a non-critical engagement with the privileges and pleasures of her class.

Cavendish, after all, does not object to the means of her self-promotion—the exploitation of natural resources, trickery, and the subjugation of common people. Endorsing, as it does, the hierarchical strictures of an absolute monarchy and denying to women any public role other than Empress, *The Blazing World* manifests both Cavendish's political conservatism and her greater connection with class, over gender, divisions. As a titled aristocrat with intimate connections to the court, Cavendish never sought to challenge or undermine the social structure of her country; she consistently viewed as destructive the attempts of the Puritan revolution—which held out so many new opportunities for women's public roles—to reorganize social divisions and to reallocate political power. Cavendish did, of course, complain about the lack of education available to women like herself, and, despite claims of reservedness, she put on public display her numerous literary and philosophical creations; she even once returned from exile to petition the commonwealth government for restitution of her husband's sequestered estate. But for every seemingly feminist statement Cavendish provides a counter: she suggested that by nature women possess weak brains, she argued that women have not been historically prominent because they were not capable of being so, and even in the utopian world that boasts a female ruler, Cavendish makes all other political figures eunuchs to guarantee that they not be influenced by wives.[38]

Lacking entirely what we might now think of as a feminist social agenda, Cavendish cannot be considered a feminist in any modern sense of the term. But she was nonetheless remarkably aware of the social and not purely rational forces that produce accepted knowledge and, in one text at least, of the workings of gender in that

process. Feminist historians of science have made us keenly aware of the gendered language that grounds early-modern science, and many feminists have come to view the classical goal of science—the revelation of "the one true story" about nature—as "a dangerous fiction" that does a disservice to knowledge as well as to human beings.[39] Surely, it is important to distinguish Cavendish from such an extreme epistemological position, since she did speak of the unavailable but existent "one truth of nature." But whatever the differences from current critiques, Cavendish was, in the *Observations* at least, uniquely aware of the gendered construction of the new science *as it was being created*: its binary categories—of observer and observed, subject and object, truth and fiction, philosophy and fancy—were to Cavendish's mind necessary finally not for discovering that "one truth of nature," but rather for producing men as "petty gods." That Cavendish herself was not able to recognize the asymmetry of her critique in the *Blazing World* demonstrates most forcefully the seductive opportunities for self-promotion that mechanistic science and technology offered.

If Cavendish's awareness of the vested self-interest of knowledge production anticipates at least the tone of current critiques of early-modern science, her sketches of an organic and vital material world are similarly evocative. In place of what she deemed to be the masculine interests served by mechanism and experiment, Cavendish offered a holistic vision of nature and experience that embraces complexity and contradiction as it derides the reduction to immutable laws and the singular power of the human mind to discover them. The organic materialism Cavendish espoused in her two works of 1666 envisions a radical connectedness in an all-animate nature, a humbling admission of self-fragmentation and of humanity as inextricably bound within nature's continuum, and a belief in the self-organizing and self-moving sufficiency of all creation. To some extent, then, Cavendish's philosophy of nature suggests the tentative moves toward a feminist science being sketched by Evelyn Fox Keller, among others, who envisions a natural science that is open to paradigms other than those that assume a subservient nature obeying the "rule of law," a science that embraces, for example, the alternative organizing concept of "order," which Keller describes in terms that Cavendish would surely endorse: "the conception of nature as orderly, and not merely law bound, allows nature itself to be generative and resourceful—more complex and abundant than we can

either describe or prescribe."[40] For Keller as for Cavendish, the binaries that regulate early-modern science reveal more about those who endorse them than they do about the nature they seek to know.

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NOTES

[1] Francis Bacon, *Francis Bacon: A Selection of his Works*, ed. Sidney Warhaft (Indianapolis: Bobbs-Merrill Educational Publishing, 1965), 299; Thomas Sprat, *The History of the Royal Society* (London, 1667), 62.

[2] Bacon, 235.

[3] Sandra Harding, *The Science Question in Feminism* (Ithaca: Cornell Univ. Press, 1986), 113.

[4] For the details of Cavendish's visit to the Royal Society, including the deferential, but condescending remarks of her hosts, see Samuel Mintz, "The Duchess of Newcastle's Visit to the Royal Society," *Journal of English and Germanic Philology* 51 (1952): 168–76.

[5] See, for example, the prefatory matter to *The Philosophical and Physical Opinions* (London, 1655), where Cavendish asks "the two most famous universities of England" to "bury [her] in silence," which, she says, "will be honour enough," since she may thereby hope for "a glorious resurrection in following ages."

[6] On the role of the conventions of gentlemanly identity and discourse in establishing credibility for empirical findings, see Steven Shapin, *A Social History of Truth: Civility and Science in Seventeenth-Century England* (Chicago: Univ. of Chicago Press, 1994).

[7] Dorothy Osborne, *Letters from Dorothy Osborne to Sir William Temple* (New York: 1888), 113; Samuel Pepys, *The Diary of Samuel Pepys*, ed. Robert Latham and William Matthews, 11 vols. (Berkeley: Univ. of California Press, 1970–1983), 8:243; and Walter Charleton, in *Letters and Poems in Honour of the Incomparable Princess, Margaret, Dutchess of Newcastle* (London, 1676), 111–12.

[8] Lisa T. Sarasohn, "A Science Turned Upside Down: Feminism and the Natural Philosophy of Margaret Cavendish," *Huntington Library Quarterly* 47 (1984), 297.

[9] Carolyn Merchant, *The Death of Nature: Women, Ecology and the Scientific Revolution* (New York: Harper & Row, 1980).

[10] Londa Schiebinger, *The Mind Has No Sex? Women in the Origins of Modern Science* (Cambridge: Harvard Univ. Press, 1989).

[11] For arguments along these lines, see Douglas Grant, *Margaret the First* (London, 1957), ch. 10; Mintz, who condescends to admire Cavendish's "childlike love of the natural world," 176; and Sarasohn, especially 293–94.

[12] The past twenty years have seen considerable work on the diverse models of nature and the competing methodologies for studying them, both within the Royal Society and outside it. The most influential of these is Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton: Princeton Univ. Press, 1985). See also Wolfgang Van Den Daele, "The Social Construction of Science: Institutionalization and Definition of Positive Science in the Latter Half of the Seventeenth Century," in *The Social Production of Scientific Knowledge*, ed. Everett Mendelsohn, Peter Weingart and Richard Whitley

(Dordrecht: D. Reidel Publishing Co., 1977), 27–55; Michael Hunter, *Science and Society in Restoration England* (Cambridge: Cambridge Univ. Press, 1981); and Merchant.

[13] The value and insight of a "stranger's account" is precisely what Shapin and Schaffer promote about Hobbes's critique of experimentalism. In order to show that "solutions to the problem of knowledge are embedded within practical solutions to the problem of social order" (15)—that epistemology and politics are interdependent—they themselves offer a "stranger's account" of Boyle's work with the air-pump and a sympathetic account of Hobbes's resistance to it. This mode of presentation, which defamiliarizes what have become normative assumptions about natural science, effectively highlights the social construction of knowledge. Though Bruno Latour has recently taken Shapin and Schaffer to task for the asymmetry of their approach (which offers a stranger's account of only one of their subjects), *Leviathan and the Air-Pump* stands as a model of sociological analysis. (See Bruno Latour, *We Have Never Been Modern*, tr. Catherine Porter [Cambridge: Harvard Univ. Press, 1993].)

Hobbes and Cavendish are, of course, different kinds of outsiders: Hobbes was much more knowledgeable about the details of contemporary experimentalism and offered in its stead a fully-worked out methodology and philosophy of nature. Cavendish, by contrast, was not nearly so systematic; she offers an attitude, a point of view, that illuminates some of the assumptions of the new science project, but it was not in her nature, nor perhaps in her ability, to contrive a "system."

[14] See Shapin and Schaffer, especially ch. 4 and 5.

[15] See Grant, ch. 10.

[16] Margaret Cavendish, *Observations on Experimental Philosophy* (London, 1666), 1.135. (Hereafter cited parenthetically in the text by section and page number and abbreviated *O*.)

[17] Bacon, 316.

[18] On the emergence of probability as an adequate level of truth-value for causal explanation in natural philosophy, see Barbara Shapiro, *Probability and Certainty in Seventeenth-Century England* (Princeton: Princeton Univ. Press, 1983) and Ian Hacking, *The Emergence of Probability* (London: Cambridge Univ. Press, 1975). For more extensive treatment of the experimental program, especially as it was envisioned by Boyle, see Shapin and Schaffer, ch. 2.

[19] Bacon, 330.

[20] Robert Hooke, *Micrographia* (London, 1665), f1^{r}.

[21] Hooke, f2^{r}.

[22] Of course, whatever the association of the new science project with Puritan aspirations for social and political reform in the 1640s and 1650s, by the time the Royal Society was established, the social program was much more conservative, emphasizing technological "progress" and social stability. See, for example, Wolfgang Van den Daele.

[23] Hooke, b1^{v}.

[24] Hooke, b1^{v}–b2^{r}.

[25] In her recent analysis of the gendered rhetoric of the new science, E. F. Keller shows how Boyle dismisses as "vulgar" the idea of man's filial obligation to an active, maternal nature in order to justify the "unveiling" of nature's secrets: man is uncovering not his mother, but a machine. (*Secrets of Life, Secrets of Death: Essays*

on Language, Gender and Science [New York: Routledge, 1992], ch. 3). Three hundred years earlier, Cavendish seems to display a similar sensitivity to the gender-encoded language of the new science.

[26] Bacon interpreted God's instructions to Adam to name the animals as an implicit endorsement of natural philosophy. See Bacon, 202.

[27] Others in Cavendish's day maintained a form of organic materialism, as, for example, Lady Anne Conway, who carried on a long correspondence with Henry More, studied with Francis Mercury Van Helmont, and whose work is believed to have had a formative influence on Leibniz's conception of the monad. But Conway's philosophical manuscript, which dates from about 1672, was not published until 1690, twenty-four years after Cavendish's *Observations*. See Merchant, ch. 11.

[28] For an extended treatment of Cavendish's construction of an unstable self, especially in relation to her authorial role, see Sandra Sherman, "Trembling Texts: Margaret Cavendish and the Dialectic of Authorship," *English Literary Renaissance* 24 (1994): 184–210.

[29] Sidonie Smith, *A Poetics of Women's Autobiography* (Bloomington: Indiana Univ. Press, 1987), 84–102.

[30] For a more subtle treatment of Cavendish's "imperial model" of female subjectivity, see Rachel Trubowitz, "The Reenchantment of Utopia and the Female Monarchical Self: Margaret Cavendish's *Blazing World*," *Tulsa Studies in Women's Literature* 11 (1992): 229–45.

[31] Sylvia Bowerbank, for example, argues that "Cavendish's response to her failure as a natural philosopher was to retreat into fancy" ("The Spider's Delight: Margaret Cavendish and the 'Female' Imagination," *ELR* 14 [1984], 402). Grant contends that "as though she had become restive under the discipline increasingly imposed upon her by natural philosophy, Margaret broke loose into extreme fantasy in this account of a new world" (206). Even Kate Lilley, Cavendish's recent and enthusiastic editor, considers *The Blazing World* to be "improbably . . . coupled with a serious treatise on natural philosophy" (*The Description of a New World Called the Blazing World*, ed. Kate Lilley [New York: New York Univ. Press, 1992], xxiv).

[32] Margaret Cavendish, *The Description of a New Blazing World* (London, 1666), b1^{v}. (Hereafter cited parenthetically in the text by section and page number and abbreviated *B*.) For easy reference, I also cite the page number of the corresponding passage in *The Blazing World and Other Writings*, ed. Kate Lilley (London: Penguin Classics, 1994).

[33] When at this point Cavendish explains the layout of the universe, she obliquely suggests the multiplicity of worlds by explaining that "if any one arrives to either of these Poles [of the world], he is either forced to return, or to enter into another world" (*B*, 1.3; 126), but she doesn't explicitly deal with the multiple worlds until much later in the text.

[34] See Shapin and Schaffer, ch. 2.

[35] In the 1666 edition, 2.35 is mispaginated as 2.121.

[36] Catherine Gallagher, "Embracing the Absolute: The Politics of the Female Subject in Seventeenth-Century England," *Genders* 1 (1988), 31.

[37] Another example of this failure occurs when the experimentalists realize that the act of observation has a disturbing tendency to affect the object observed. The experimentalists realize that they cannot determine the course of the circulation in the blood because "as soon as they had dissected an animale creature . . . the interior corporeal motions proper to that particular . . . creature were altered" (*B*, 1.35; 146).

[38] See, respectively, Margaret Cavendish, *The World's Olio* (London, 1655), Preface to the Reader (n.p.) and *B*, 1.17–18; 135.

[39] The phrase is Sandra Harding's (195).

[40] Evelyn Fox Keller, *Reflections on Gender and Science* (New Haven: Yale Univ. Press, 1985), 134.